Citation:

Reynolds MW, Fredman L, Langenberg P, Magaziner J. Weight, weight change, mortality in a random sample of older community-dwelling women. *J Am Geriatr Soc.* 1999 Dec;47(12):1409-14.

PubMed ID: 10591233

Study Design:

Prospective Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To evaluate the relationship between measured weight, weight change (gain, loss and weight cycling) and six year mortality risk using a random sample of community-dwelling women aged 65 and older.

Inclusion Criteria:

- Community dwelling
- White ethnicity
- Age 65 years or older
- Resident of northeast Baltimore, Maryland.

Exclusion Criteria:

- Not community dwelling
- Ethnicity other than white
- Less than 65 years of age
- Residing outside of northeast Baltimore, Maryland
- Missing two or more weight values
- Required a proxy interview at any of the three interviews

Description of Study Protocol:

Recruitment

- Random sample of households in Baltimore, Maryland

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Design: Prospective cohort study

- Data collected using standardized questionnaire and administered in person at respondents' residences by trained interviewers
- Weights taken at each home visit
- Sample categorized into three BMI groups
  - Low: BMI<23 kg/m^2
  - Average: BMI>23 kg/m^2 and <28 kg/m^2
  - High: BMI>28 kg/m^2
- Sample categorized into four categories of weight change
  - Weight gain: more than a 4.5% gain between first and second interview, more than a 4.5% gain between the second and third interview or a cumulative 7.5% gain between the first and third interview
  - Weight loss: more than a 4.5% loss between first and second interview, more than a 4.5% loss between the second and third interview or more than a cumulative 7.5% loss between the first and third interview
  - No change
  - Weight cycling: more than 4.5% (gain or loss) in BMI between the first and second interview and more than a 4.5% change in BMI in the opposite between the second and third interview
- Mortality data was collected using obituaries from local newspapers and reports from family members as well as information from the Maryland Department of Vital Statistics and National Death Index

Blinding used (if applicable): not applicable

Intervention: Not applicable

Statistical Analysis

- Differences in the distributions of categorical risk factors by level of BMI and by level of weight change were tested using chi-square tests
- Continuous covariables were examined using analysis of variance to detect significant mean differences across weight groups and weight change groups
- Logistic regression analysis used to investigate relationship between weight, weight change, covariates and mortality
- Cox Proportional Hazards model
- Statistical significance at $p<0.05$.

Data Collection Summary:

Timing of Measurements

- Three interviews conducted annually from 1984 to 1986
- Body weight measured at each interview
- Height measured at baseline interview
- BMI calculated using baseline measured height and weight
- Covariates including age, education, smoking status, alcohol usage and pre-existing illness were measured during the first interview

Dependent Variables

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- Mortality

Independent Variables

- BMI
- Weight change

Control Variables

- Age
- Education
- Smoking status
- Alcohol use
- Pre-existing illness.

Description of Actual Data Sample:

Initial N: 806 females

Attrition (final N): 648 females

Age: 73±6.1 years

Ethnicity: All subjects were White women

Other relevant demographics:

- Education
  - Women with less than high school education were significantly more likely to have high baseline BMI and less likely to have low baseline BMI compared with respondents with at least some college education (p=0.01)

Anthropometrics:

- Average baseline BMI for the sample was 26.3±4.8 kg/m^2
  - 135 subjects (20.8%) in low BMI group
  - 332 subjects (51.2%) in average BMI group
  - 181 subjects (27.9%) in high BMI group

Location: Baltimore, Maryland.

Summary of Results:

Key Findings

- Women with low baseline BMI were more likely than women with high or average baseline BMI to have gained weight or weight cycled and less likely to have had no weight change
- Women who lost weight were also significantly older than those women who gained weight or had no weight change (p=0.001)
- 106 women (16%) died over the follow-up period
- Women who lost weight generally had highest mortality rates with highest mortality weight

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rate in women with low baseline BMI and whose weight did not change during the next two years
- Women with average BMI who gained weight over the next two years had the lowest mortality rates
- Significant differences in the crude survival rates were found for both the BMI groups and the weight change groups
- Statistically significant interaction was found between BMI and weight change
- Women who lost weight had significantly increased mortality risk at every level of BMI
- Women with low baseline BMI also had significantly increased mortality risk, regardless of weight change status
- Weight cycling was associated with an increased risk for mortality at all levels of baseline BMI

Adjusted Proportional Hazards Regression Results for the Association of Weight and Weight Changes with Six Year Mortality Among 648 Older Community- Dwelling Women

BMI Weight Change Subgroups	Risk Ratio	95% Confidence Interval	P Value
Low BMI; Weight Loss	3.06	(1.32, 6.17)	0.002
Low BMI; Weight Gain/No Change	3.24	(1.64, 6.39)	<0.001
Low; Weight Cycle	2.64	(1.10, 6.38)	0.031
High; Weight Loss	2.53	(1.30, 4.89)	0.006
High; Weight Gain/No Change	1.55	(0.77, 3.11)	0.222
High; Cycle	2.94	(1.21, 7.15)	0.017
Average; Weight Loss	3.84	(2.14, 6.89)	<0.001
Average; Weight Cycle	2.24	(0.94, 5.35)	0.069
Average; Weight Gain/No Change	1.0		

Other Findings

- Current smokers were significantly more likely than former smokers or never smokers to have lower baseline BMI (p=0.001)
- Women excluded from the analyses due to proxy status differed from the rest of the sample as they were significantly older (p<0.001) and had more pre-existing illness (p<0.001)
- Women who were excluded from study because of a lack of any subsequent BMI value were less educated (p<0.001), older (p<0.001) and less likely to consume alcoholic beverages (p=0.05) than women who remained in the analysis.

Author Conclusion:

The study found that having a low BMI (<23 kg/m^2) and weight loss of more than 4.5% in one year were both associated with an increased risk of mortality over a six year period in

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community-dwelling white women aged 65 years and older. There was a significant increase in risk of mortality in women with low baseline BMI who did not change weight; the increased relative risk seemed to result from being underweight, independent of various risk factors examined. The results of this study not only added to the epidemiologic evidence on the adverse health consequences of weight loss and weight cycling in older women but suggest further studies to examine the interaction of baseline weight and weight change on health outcomes.

Reviewer Comments:

- *Only 6 years of follow-up; but the effects of weight change on mortality in the study are the result of a 2-year weight change*
- *Almost 20% of the original respondent population were not able to provide weight change data because of missing data or proxy interviews*
- *Generalizability may be limited due to all white population derived from one location as well as significant differences between study group and excluded subject group*
- *Type of weight loss (intentional or unintentional) not evaluated*
- *Strength of the study includes fact that height and weight were measured and not self reported.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes

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2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes

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5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes

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	7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**		Yes
	8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
	8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
	8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
	8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
	8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
	8.6.	Was clinical significance as well as statistical significance reported?	Yes
	8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**		Yes
	9.1.	Is there a discussion of findings?	Yes
	9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**		Yes
	10.1.	Were sources of funding and investigators' affiliations described?	Yes
	10.2.	Was the study free from apparent conflict of interest?	Yes

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